# The Thermograde System of Heating

TD CAT 1906 Thermograde Valve Co.

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# The Thermograde System *of* Steam Heating

## A Semi-Automatic Method of Heat Regulation

*For the most advantageous utilization of live and exhaust steam at low pressure*

THERMOGRADE VALVE COMPANY

*BOSTON* *BALTIMORE*

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THE THERMOGRADE VALVE COMPANY owns and controls United States and foreign patents covering the operation and construction of the Thermograde System of Heating and the Thermograde appliances. It manufactures and sells these appliances, and adjusts its own apparatus upon completion of installation. No license or royalty of any kind is charged for the use or operation of the Thermograde System or the Thermograde Appliances.

This Company does neither a contracting or engineering business. It does not undertake to install heating apparatus of any kind. It is prepared, however, at all times, to advise as to the proper and most advantageous design of heating installations, and will readily furnish estimates concerning any specific work upon receipt of information. Owing to the varying conditions incidental to the arrangement and adjustment of each particular building, it is impossible to fix a flat rate for the Thermograde apparatus, and this Company, therefore, quotes prices on each particular installation. This Company will not be responsible for estimates upon any work unless specific quotations covering such work have been obtained from it.

This Company is prepared to guarantee the successful operation of the Thermograde apparatus wherever the heating system has been installed in accordance with its requirements and subject to its approval.

*At intervals throughout this catalogue will be found illustrations of some of the various buildings in which the Thermograde System has been installed. These illustrations will give, perhaps, a better idea of the character and magnitude of the work we are doing than could be conveyed in any other way.*

JANUARY, 1906.

APTHORPE HOUSE
Harvard University Dormitory, University Associates, *Owners*
A. B. Franklin, *Heating Contractor*

Coolidge & Carlson, *Architects*, Boston
Densmore & LeClear, *Engineers*

# The Thermograde System of Heating

THE Thermograde System of Heating was designed originally as a simple and efficient method which would overcome the objections to the ordinary forms of heating by direct radiation.

These objections may be summed up as a lack of regulation or control, of the heat emitted by the radiator, water hammer or pounding, air binding, flooded and frozen radiators, the difficulty of ordinarily having to operate two valves in connection with each radiator, the inconvenient location of these valves, the leaking and clogging of air valves, the obnoxious odor of the spent gases which they give forth, poor circulation, and lack of economy.

That these objections are real and not imaginary is shown by the many different devices and methods that have been brought out from time to time to overcome them,—there are several kinds of vacuum systems; several so-called vapor systems; a number of thermostatic and automatic control systems; and many others of one kind and another, each requiring a more or less complicated system of piping, with usually considerable auxiliary apparatus in the way of pumps, pressure regulating devices, air compressors, etc.; many calling for considerable additional radiation, and no one of them effectually overcoming all the difficulties enumerated above.

The Thermograde is a natural system of heating, — natural in that it employs no auxiliary apparatus in the way of pumps, etc., to bring about its results,—and it does meet the objections that have been raised against the ordinary methods of heating.

## EXPERIENCE

THIS system has been in successful operation for some seven years, and its use has spread until now it is installed in buildings of all kinds, — dwelling houses, hotels, office buildings, apartment houses, college dormitories, club houses, etc., — in many of the principal cities of the country.

## ADVANTAGES

THE Thermograde System offers the following advantages:

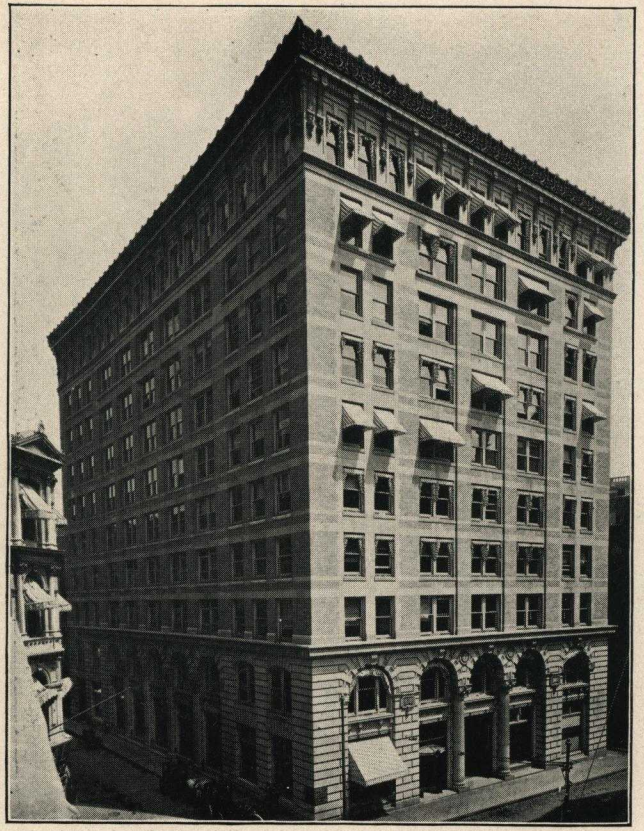
It affords a perfect method of semi-automatic heat regulation; it enables each individual radiator to be heated fractionally: one-quarter hot — three-quarters cold; one-half hot — one-half cold; wholly hot or wholly cold, or partially, as may be desired.

But one valve, the supply, has to be operated in connection with each radiator; the return, or Autovalve, is entirely automatic and requires no attention from the occupant of the room. Thus this system, as far as operation is concerned, possesses all the advantages of the ordinary one-pipe system.

RANDOLPH HALL

Coolidge & Carlson, *Architects*, Boston
Densmore & LeClear, *Engineers*

Harvard University Dormitory, University Associates, *Owners*
A. B. Franklin, *Heating Contractor*



State Mutual Building, Boston
Andrews, Jacques & Rantoul, *Architects*, Boston
Buerkel & Co., *Engineers*, Boston
Walworth Cons. & Supply Co., *Heating Contractors*, Boston

The supply valve, or Thermograde Control Valve, is placed at the top of the radiator, where it is easy of access, and where one does not have to stoop to get at it. The operation of the Auto-valve is entirely independent of the Control Valve, and does not depend upon it in any way for its successful working. The Control Valve can be left in any position from shut to fully open without affecting the operation of the system in the slightest degree.

No air valves are used on the radiators of this system,—there is absolutely no way in which the obnoxious radiator gases can escape into the room.

It insures freedom from water hammer or pounding throughout either the radiators or piping.

It does away with the danger of flooded or frozen radiators.

It is impossible for air binding to occur in any part of the system.

It assures a positive circulation through every part of the apparatus at a decidedly lower pressure than is possible in the ordinary system, and further, this circulation is brought about very much more quickly than with the ordinary steam system.

It effects an economy in the use of steam, — therefore fuel, — ranging from ten to forty per cent; this as shown by the continued operation of large installations.

Furthermore, it is not necessary to employ auxiliary apparatus or accessories of any kind, such as ejectors, vacuum pumps, etc., in connection with the Thermograde System.

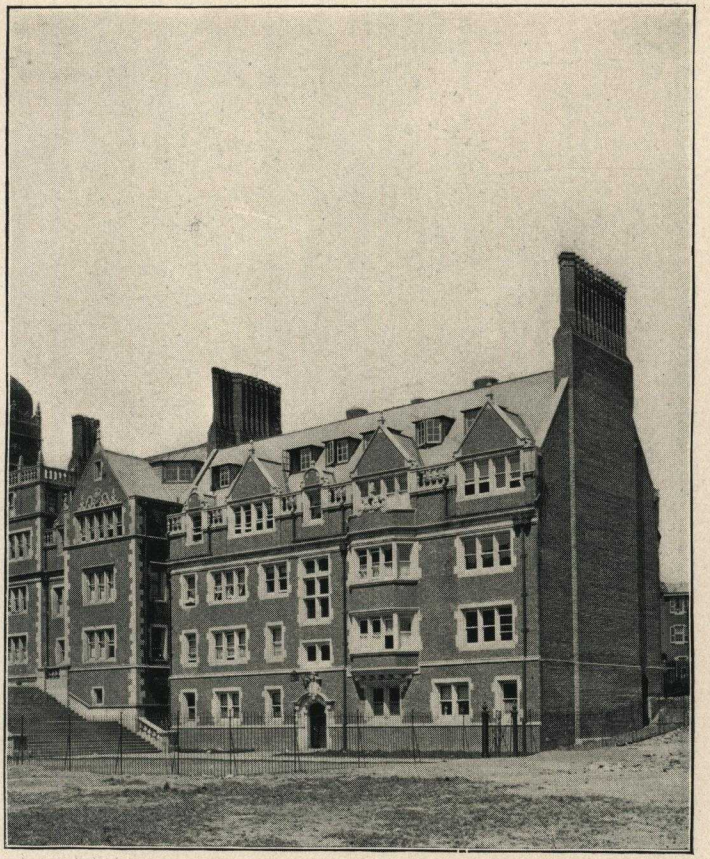
## DESCRIPTION

THE Thermograde System of Heating is a two-pipe steam system adapted for use in connection with either live or exhaust steam, where the water of condensation is returned to the boiler mechanically, or by gravity. No air valves are used on this system, and there is but one valve, the Control, to be operated in connection with each radiator, the return, or Autovalve, being automatic and requiring no attention. The return side of the system (the return mains and risers) is opened to the atmosphere at one or more points, thus preventing any accumulation of air pressure throughout the apparatus. Whatever steam pressure may exist on the supply side of the system is prevented from passing into the open return mains and risers by means of the Autovalves placed at the return end of each radiator. These Autovalves are always open except when the radiator is wholly hot, when they close, confining the steam to the radiator; in other words, the Autovalve affords a free passage to air and water, but prevents the escape of steam into the returns.

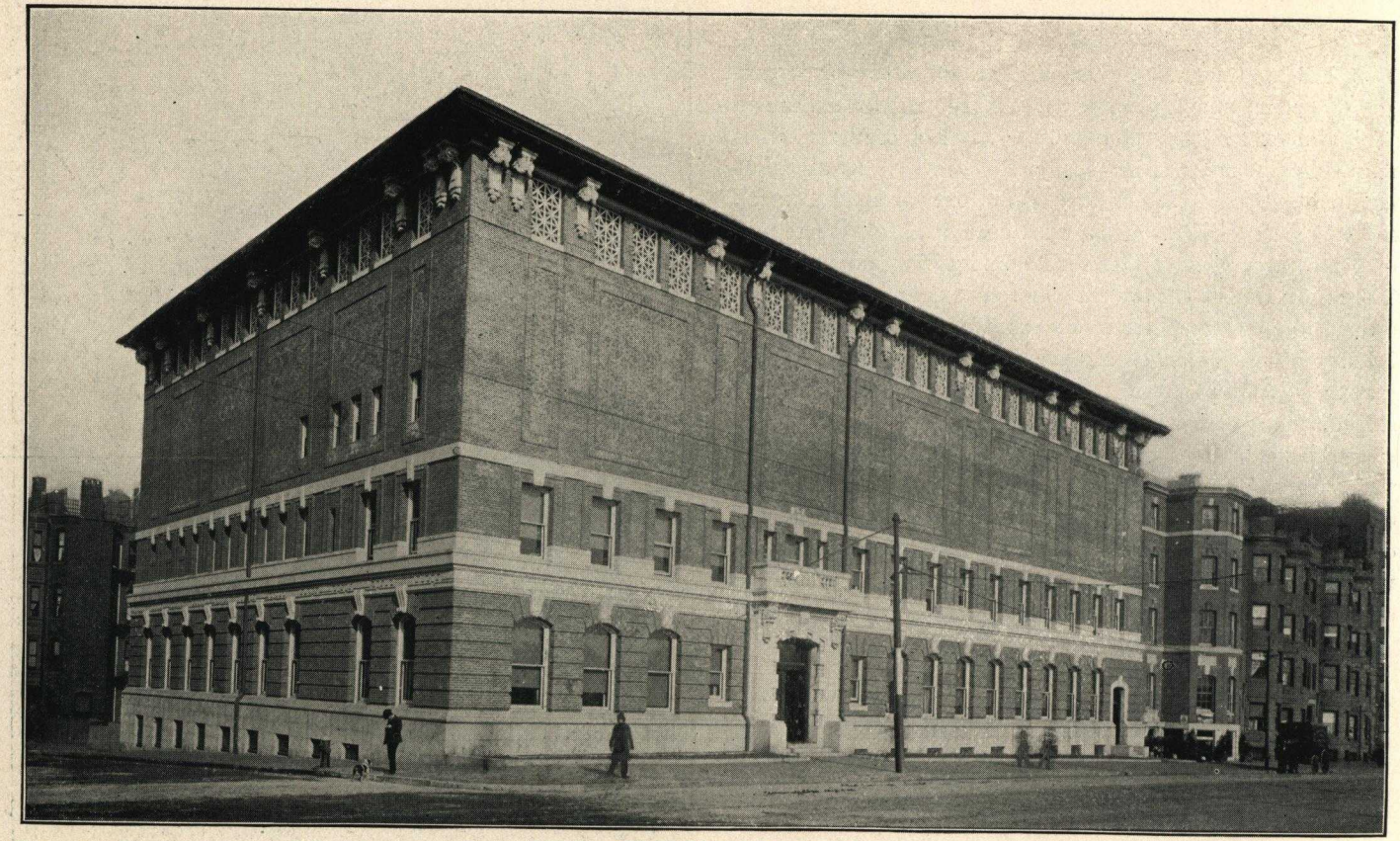
## PRINCIPLES

THE essential principles of this System are as follows: suppose a boiler carrying a constant pressure of steam, a radiator with surroundings at a substantially fixed temperature, and a pipe connection between the boiler and the radiator. Let the return end of the radiator be left open for observation. It is obvious that under these conditions a throttle, diaphragm,





SMITH HOUSE, UNIVERSITY OF PENNSYLVANIA DORMITORY
Henry W. Spangler, *Engineer*, Professor of Steam Engineering, University of Pennsylvania
E. M. Nichols, *Heating Contractor*, Philadelphia



TENNIS AND RACQUET CLUB, BOSTON, MASS.

Parker & Thomas, *Architects*, Boston and Baltimore

Smith & Anthony, *Heating Contractors*, Boston

or orifice of fixed opening may be inserted in the steam pipe so that the weight of steam discharged by the boiler through it will be exactly equal to that condensed by the radiator in equal times. For example, if the radiator condenses twelve pounds of steam in an hour, the orifice, if properly proportioned, would pass an equal weight of steam under the given pressure in that time. From the return end of the radiator, air would at first escape, then air and water, and finally, when the action was established, nothing but water.

For the orifice with fixed opening a valve with fixed opening may be substituted, and since the discharge of steam under constant pressure is proportional to the size of the orifice, if the valve is only one half open, the quantity of steam discharged would be only one half, and only one half of the radiator will be heated, and so on. It will be seen that no steam escapes from the return end of the radiator, hence no pressure can arise in the return pipe if provision is made for the escape of air. The return pipe, therefore, is a simple drain pipe open to the atmosphere. Its horizontal portions are "dry"; it enters the boiler by gravity below the water line, or through a pump and receiver.

These principles, together with means whereby the chief advantage of the old-fashioned high-pressure system may be obtained, constitute the elements of the Thermograde System.

When occasion demands it, and it is desired to heat the radiator fully hot in a short time, an emergency opening in

COMPTON BUILDING, BOSTON, MASS.
Winslow & Bigelow, *Architects*, Boston  Ingalls & Kendricken, *Heating Contractors*
Buerkel & Co., *Engineers*, Boston

BANK OF COMMERCE BUILDING, NORFOLK, VIRGINIA

Parker & Thomas, *Architects*, Boston and Baltimore
Adams & Schwab, *Engineers*, Baltimore and Chicago
Cleghorn Co., *Heating Contractors*, Boston

the Thermograde Control Valve provides a relatively unlimited quantity of steam, while at the same time steam is kept out of the returns by means of the Autovalve. It will be observed that the operation of this Autovalve is totally independent of that of the Control, and that the Control can be left in any position from completely shut to fully open without interfering with the operation of the Autovalve in any respect.

Additionally, each radiator is independent of all the others, and of two radiators standing side by side, one may be operated at one half hot, for example, while the other is wholly hot.

## PIPING

THE piping of the Thermograde System presents no difficulties, nor does it demand any special fittings or requirements. It is practically the same as that for any ordinary two-pipe system, with the exception of the omission of the air valves; the sizes are the same as would ordinarily be required for a system of this kind. The essential requirement is that the return side of the system shall be free from pressure of either air or steam, and to this end must be vented, or opened to the atmosphere at one or more points, as may be necessary on the particular work in hand.

This may be done in several ways,—either by extending the return risers one-half inch to the attic or roof space, and there connecting them together by a three-quarter inch

horizontal, free from water pockets, with a one inch open end branch to the atmosphere for every six to twelve risers, or by venting the return main at various points. The return main is usually "dry," and is designed to run only one third or one half full of water. The water of condensation can be returned to the boiler as stated before, either through a receiving tank and pump, or by gravity. When returning to a receiving tank, this tank should also be vented.

All drips from the supply mains and risers should discharge into the return side of the system through Thermograde Autovalves or should be carried back through a separate drip line to the boiler, or to the receiving tank through a trap.

## RADIATION

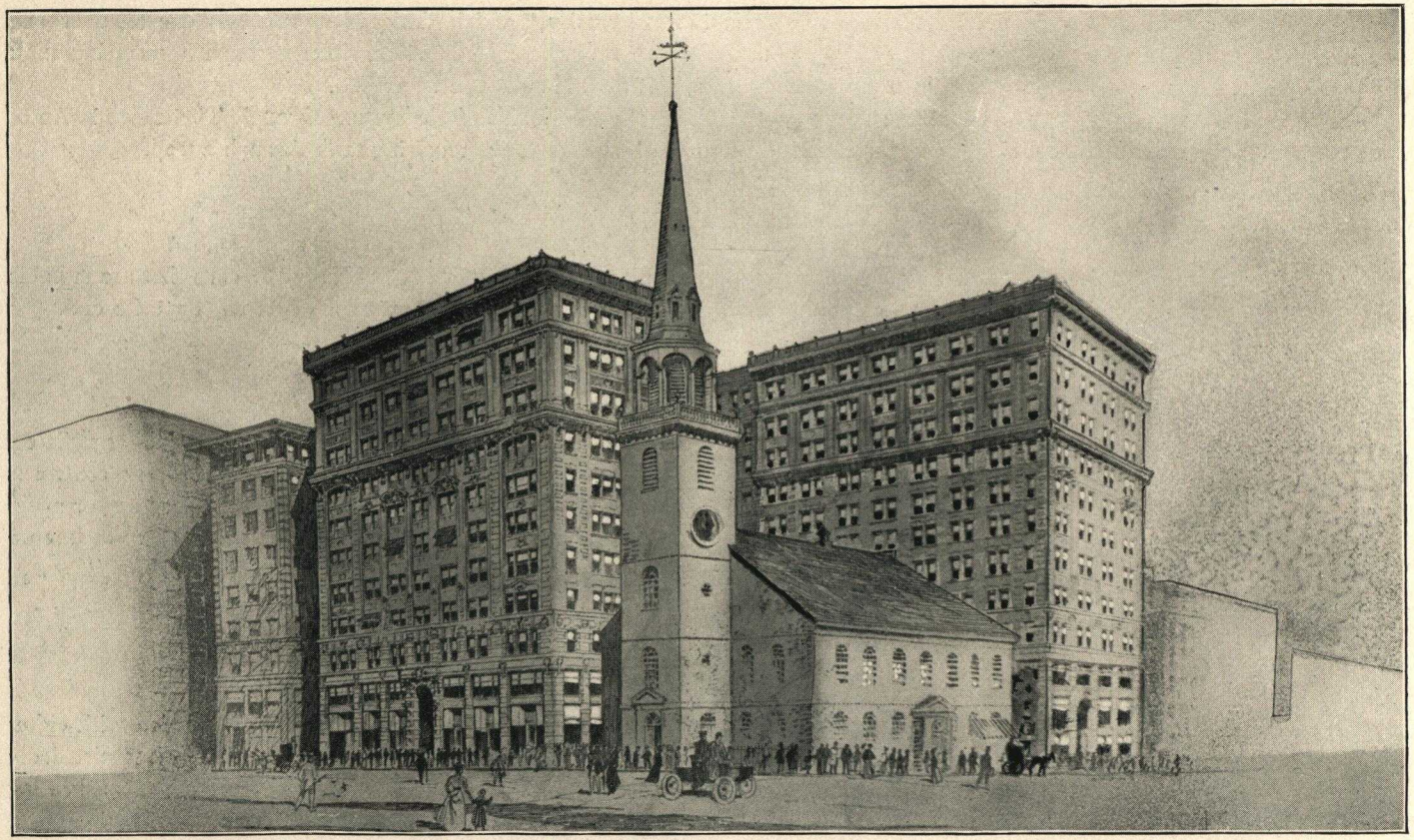
NO additional radiation is required over that necessary for any ordinary steam system, but radiators or coils that are suitable for hot water should be used, making the supply connection at the top and the return at the bottom, opposite end.

## REGULATION

THE Thermograde System provides a complete control of the heat of each radiator independently of every other radiator, and in this respect it is unapproached by any other method of heating. In the ordinary system absolutely no control is possible; in the thermostatic automatic, as far as the radiator itself is concerned, it is a case of either full heat or none. In comparison with hot water heating, the Thermograde System offers all the advantages of steam, — a quicker and more intense heat for emergencies, smaller piping and much less radiation, — while at the same time the regulation effected by the Thermograde is decidedly more positive and more sensitive than that of hot water.

## MILL AND FACTORY WORK

IN mill and factory heating also the Thermograde System finds a large field. Here the Thermograde Autovalve, with either the Thermograde graduating Control Valve, or in connection with the ordinary hand wheel valve, makes a decidedly efficient apparatus, and one that for simplicity and economy cannot be approached by any other method of heating for this purpose.



Shepley, Rutan & Coolidge, *Consulting Architects*
Clinton J. Warren, *Architect*

OLD SOUTH BUILDING BOSTON, MASS.

Cleghorn Company, *Heating Contractors*

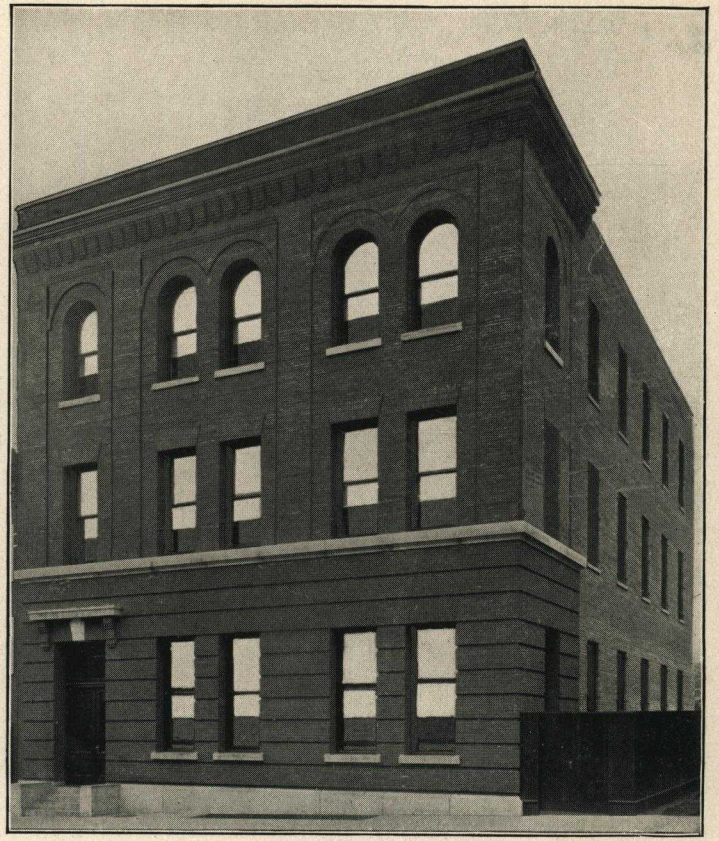
## EXHAUST STEAM

THE Thermograde System is especially adapted for use in connection with exhaust steam for heating. The low pressure necessary to effect a circulation makes it applicable where a minimum of back pressure at the engine is thought desirable, and it has proven a most efficient apparatus when used in this manner.

## ECONOMY

ONCE the operation of the Thermograde System is fully understood, it becomes self-evident that a decided economy must be effected in the operation of any plant installed in this manner. The Control Valve is economical from its very method of operation, as it uses only as much steam as is wanted, and no more. The Autovalve is even more efficient, as it absolutely prevents the wasting of any steam into the returns, only condensed water and air passing the valve, all steam being condensed in the radiator itself. Many Thermograde plants are in operation that are showing savings ranging from 10 to 40%, over similar ordinary two-pipe installations. Furthermore, in addition to being economical in operation, the Thermograde System offers many advantages in the way of economy of maintenance. Neither the supply or the return valve, has to be repacked from time to time, as with the ordinary radiator valves; and both valves, from their construction, are easily and quickly accessible and can be taken apart and cleaned with little trouble.





WOLFE STREET EXCHANGE, BALTIMORE, MD.,—CHESAPEAKE & POTOMAC TELEPHONE CO.
Eidlitz & McKenzie, *Architects*, New York
Johnson & Morris, *Heating Contractors*, New York and Washington

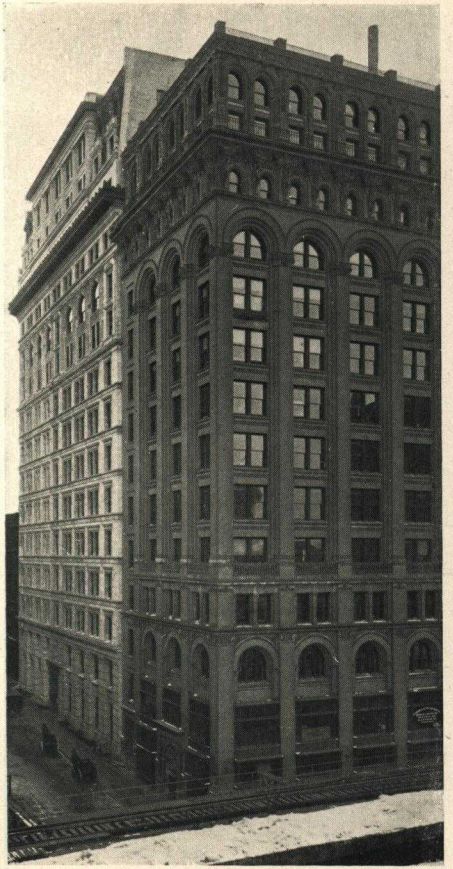
India Building, Boston, Mass.
Peabody & Stearns, *Architects*, Boston  Lynch & Woodward, *Engineers & Contractors*

## CIRCULATION

IN the operation of the Thermograde System it will be noted that a difference of pressure always exists between the supply side and the return side, — this difference of pressure need be but slight, but the point is, that a positive difference always does exist.

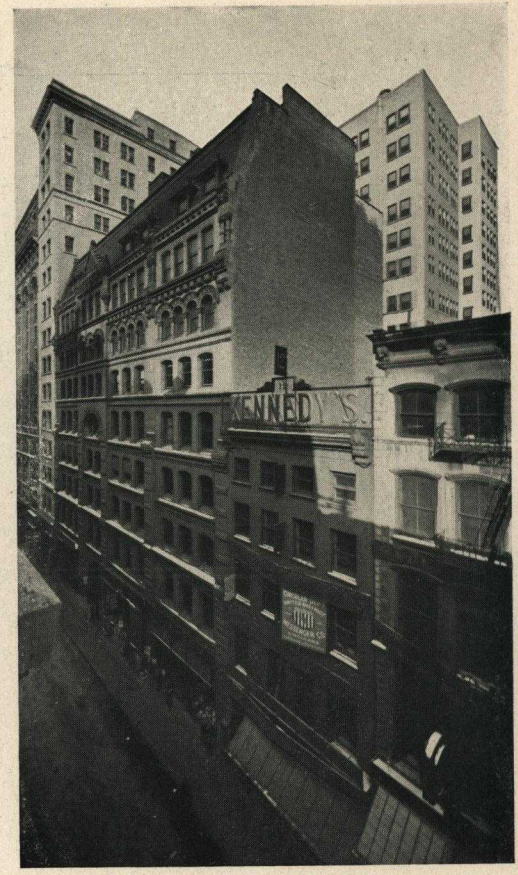
In the ordinary two-pipe system, there is practically no difference of pressure between the supply and the return sides, — whatever pressure exists on the supply side always exists on the return side, allowing for friction losses, and the only incentive there is for steam to circulate from the supply to the return side lies in the fact that some steam is necessarily condensed in the radiators and the return mains and risers, and that steam from the supply side flows in to take the place of that which is condensed. In the Thermograde System, on the other hand, there is absolutely no pressure on the return side at any time. Should there be a definite pressure on the supply side, then there is bound to be a definite difference of pressure between the supply and the return sides; or, in other words, under the Thermograde conditions there is bound to be as strong an initial tendency for the steam to circulate from the supply to the return side as if it were freely exhausted into the atmosphere.

The fact that with the Thermograde System this positive difference of pressure between the two sides of the system does exist, is what enables us to effect a circulation at a pressure but slightly above that of the atmosphere. This difference of



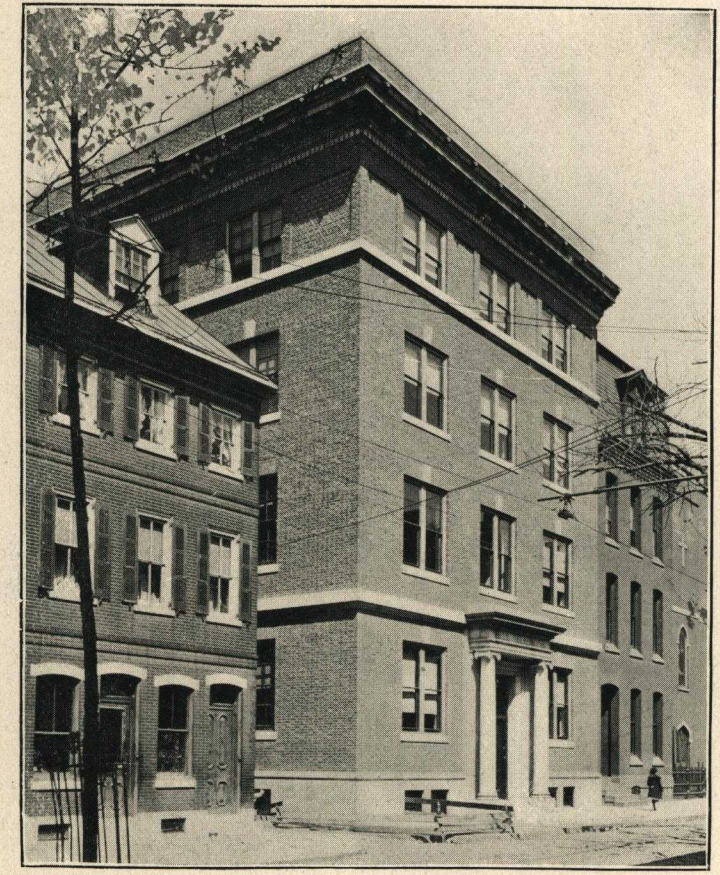
DEY STREET BUILDING, NEW YORK TELEPHONE CO.
Eidlitz & McKenzie, *Architects*
Baker, Smith & Co., *Heating Contractors*

CLUB-HOUSE AND STABLE FOR JAMES HENRY SMITH
Warren & Wetmore, *Architects*
Baker, Smith & Co., *Heating Contractors*




CORTLANDT STREET BUILDING, NEW YORK TELEPHONE CO.
Eidlitz & McKenzie, *Architects*
United Heating Co., *Heating Contractors*

SOME THERMOGRADE INSTALLATIONS IN NEW YORK CITY



LOMBARD EXCHANGE, PHILADELPHIA, — BELL TELEPHONE CO.
Rankin, Kellogg & Crane, *Architects*, Philadelphia
E. M. Nichols, *Heating Contractor*, Philadelphia

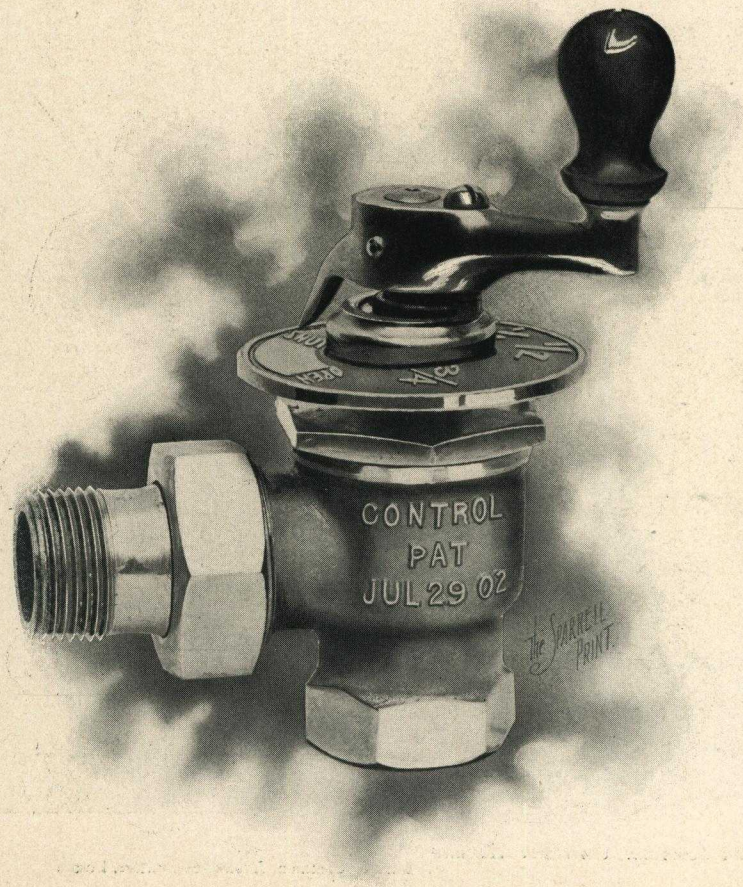
pressure need be but a fraction of a pound; but even then, as we have said, it is more than exists in the ordinary system; and further, we are also enabled to effect a much quicker circulation than is possible with an ordinary low-pressure system.

The following illustration will perhaps make this point more, clear and show why it is that with the Thermograde System there is such a positive circulation through every part of the apparatus. Suppose we have an ordinary two-pipe system operating under two pounds pressure. Then whatever pressure exists on the supply side necessarily exists on the return side, and therefore both sides will be under a pressure of two pounds. Under these conditions there is practically no tendency for a circulation from the supply to the return side, as the pressure on both sides is equal. Let us now suppose we have a Thermograde System operating under the same pressure; then the supply side, as before, is under a pressure of two pounds, but on the return side there is no pressure, and there is a tendency for steam to flow from the supply to the return equal to the pressure on the supply side, or two pounds. This tendency to circulate from the supply to the return side exists in the Thermograde System under all conditions and is positive at all times. Under the usual conditions, it does not exist in the ordinary system and cannot be obtained unless auxiliary apparatus — such as ejectors, or pumps — is used to produce it.

HAMPDEN HALL, HARVARD UNIVERSITY DORMITORY, UNIVERSITY ASSOCIATES, OWNERS

Coolidge & Carlson, *Architects*, Boston

Bradlee & Chatman, *Heating Contractors*, Boston



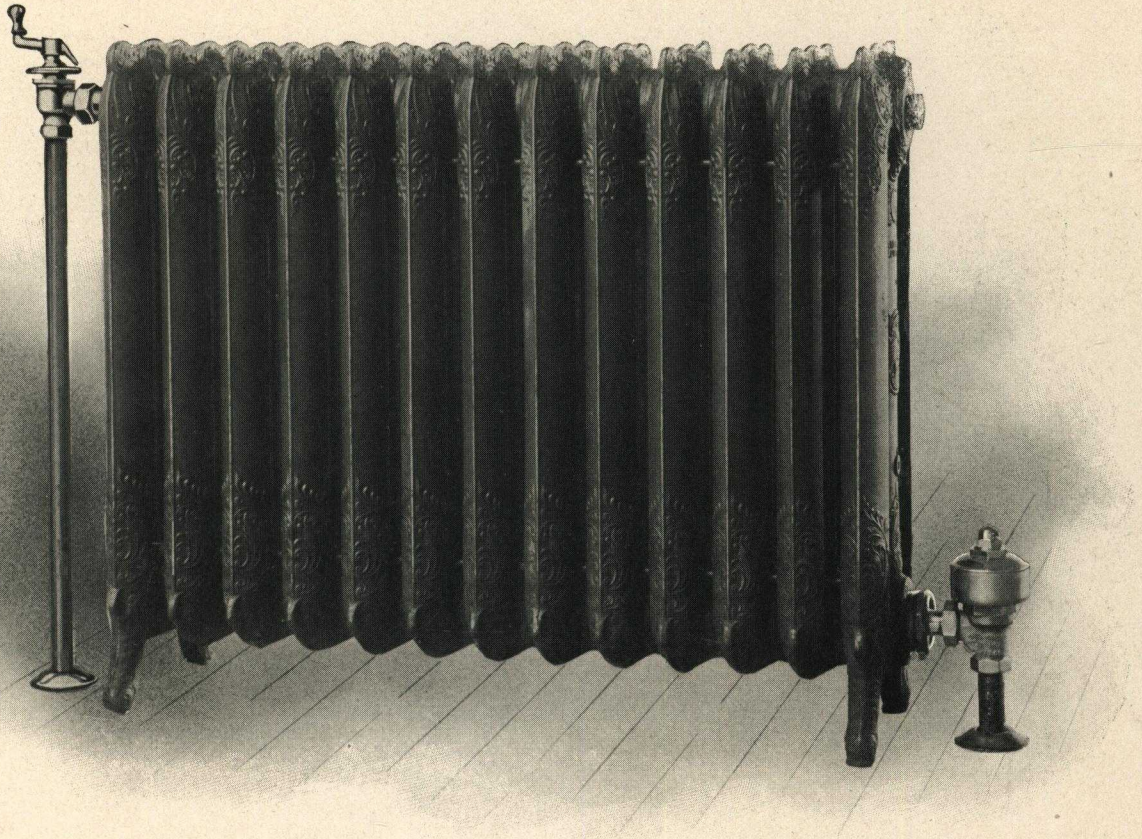

## CONTROL VALVE

THE Thermograde Control Valve, or supply valve, is the only valve to be operated in connection with each radiator on the Thermograde System, and its entire range of motion extends but from "Shut" to "Open," as shown on the dial. This is less than one full revolution of the handle, and makes it decidedly easy of operation in comparison with the ordinary radiator valve. This valve is designed in every detail for use in connection with the Thermograde System. Each one is especially adapted to the radiator it controls, and each one is adjusted to its own radiator under the actual working conditions of its particular installation.

The valve itself is constructed throughout of the best steam metal; it is fully nickeled, is simple, durable, and readily accessible in every part. It has no stuffing boxes to leak, as has the ordinary valve, and does not require repacking from time to time. As will be seen from the cut, its regulation is self-indicated upon the dial.

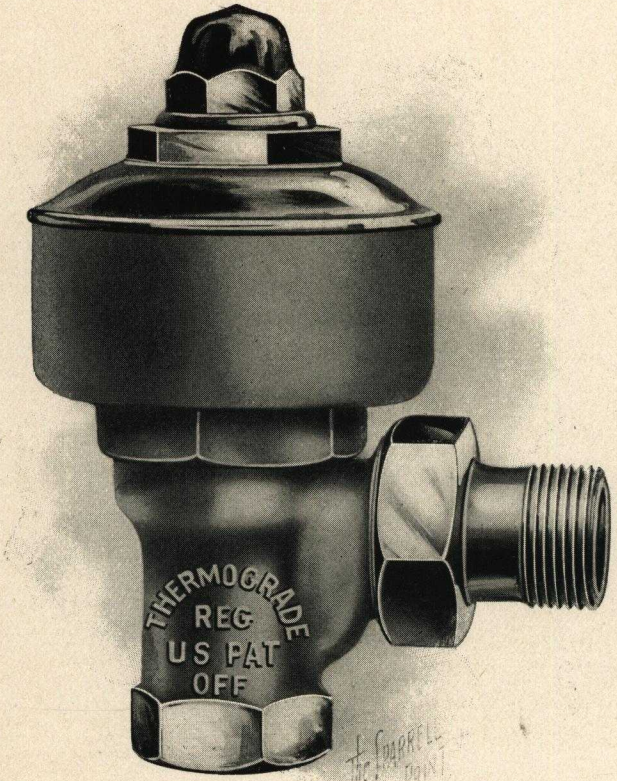
When it is set to one half, for instance, one half of the radiator to which it is attached will become steam hot, while the remaining half will be practically cold.

This valve, in addition to its feature of graduation, possesses all the advantages of the ordinary globe or gate valve, and can be forcibly closed to its seat so as to be tight under all ordinary conditions. Each valve is tested under high pressure before shipment, and will be found perfect in all respects.





THERMOGRADE SYSTEM AS APPLIED TO AMERICAN RADIATOR




## AUTOVALVE

THIS Autovalve, as shown in the cut, is compact and self-contained, taking up but little room and being accessible in almost any position. It has been carefully designed in every particular, pains being taken to produce a simple and efficient apparatus in every respect, and one that can be easily removed and adjusted, or cleaned, if need be, by the ordinary engineer. All parts of this valve are interchangeable, and can be renewed, if necessary, at slight expense without disconnecting the valve itself from the radiator or piping. Furthermore, it will be noted that this valve has no packing of any kind, thus absolutely preventing the dripping and sizzling from leaky stuffing boxes that so often occurs with the ordinary radiator valves.

The valve throughout is constructed of the very best steam metal, and is fully nickeled. Every part is carefully inspected before assembling, and each valve is subjected to both steam and water tests at high pressures, before leaving the factory.

This Autovalve is manufactured in the angle, right and left hand corner, and straightway types.

THE WASHINGTON, APARTMENT HOUSE, BALTIMORE, WM. F. COCHRAN, JR., OWNER

Edward H. Glidden, *Architect*, Baltimore — Adams & Schwab, *Engineers* — Crook, Horner & Co., *Heating Contractors*

COMMONWEALTH HOTEL, BOSTON, MASS.

C. J. Warren, *Architect*, Boston

Cleghorn Co., *Heating Contractors*

## REMEMBER

No additional radiation.

No special piping.

No air valves.

No pumps or ejectors.

## BUT

Perfect control of the heat at all times.

Absolute freedom from water hammer or air binding.

Economy of operation.

Perfect circulation.

But one valve to be operated in connection with each radiator.

A minimum of attention.

A maximum of results.

A modern heating system.

*with the Thermograde.*

THE
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